

**ARADIDAE IN THE SOUTH AUSTRALIAN MUSEUM,
ADELAIDE (HEMIPTERA-HETEROPTERA)**

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By the kind offices of Mr. Gordon F. Gross, Senior Curator of Invertebrates at the South Australian Museum, Adelaide, I have been privileged to study an important lot of unidentified Aradidae, mostly from Australia and Pacific Islands South of Equator, for which I wish to express my sincere gratitude to him.

Of particular interest was a batch of material collected by A. M. Lea on Fiji, Norfolk Island, Lord Howe Island, Tasmania, and Australia, amongst it many new species.

Because of the large number of species involved, this paper treats only the subfamilies: Isoderminae, Prosympiestinae, Aradinae, Calisiinae, Anenrinae, and Carventinae, the Mezirinae will be treated separately in the next paper. All measurements indicated in this paper were taken with a micrometer eyepiece, 25 units equalling 1 mm. The first figure in the ratio represents the length, and the second the width of the measured part. The length of abdomen was taken from the tip of scutellum to the tip of hypopygium (♂), or segment IX respectively (♀), only in the genus *Calisius* Stål was it taken from the fore border of connexivum II to the tip of hypopygium, or segment IX.

Fourteen of the species of Aradidae treated in this paper were found to be new; of these only five were from continental areas, the other nine were from islands. It is significant that five new species belong to the genus *Calisius* Stål, 1860, and four to the genus *Carventus* Stål, 1865.

Subfamily ISODERMINAE Stål, 1873

Gen. *Isodermus* Erichson, 1842

In Australia and Tasmania only one species is known, *Isodermus planus* Erichson, 1842. Other species have been recorded from New Zealand and South America. *Isodermus* has a curious habit of breaking off its hemelytra at the level of the tip of the scutellum, this probably occurs after copulation.

1. *Isodermus planus* Erichson

Isodermus planus Erichson, 1842, Arch. Nat.-Ges.; 8: 280 t. 5, fig. 9.

Some of the specimens represented in this lot were very old, collected by Tepper in 1884, most of them already damaged.

1 ♂ & 1 ♀, Tasmania, Burnie—Lea coll.; 1 ♀, Tasmania, Marrawah—Lea coll.; 2 ♀, S. Australia, Meningie—H. Mincham coll.; 1 ♂, Victoria, Mt. Buffalo—F. E. Wilson coll. 21.XII.51; 1 nymph, Victoria, Beaconsfield—F. E. Wilson coll. 3.VI.18; 2 ♂ & 10 nymphs, Avenue Range—D. J. Barret coll. VIII.55; 1 ♂, Konttums Poultry Yard—1.IX.1886; 1 ♂ & 1 ♀, S. Australia, Mt. Lofty—Tepper coll. 4.XI.1884; 1 ♀, Bridgewater—Tepper coll. 2.II.1884; 1 ♂, 4 ♀ & 5 nymphs, Kangaroo Is.—G. W. Mellor coll. X.1905.

Subfamily PROSYMPIESTINAE Usinger and Matsuda, 1959

The Prosympiestinae have the same pattern of distribution as the Isoderminae, there are only four genera, of which only *Prosympiestus* Bergroth, 1894, is represented in Australia and Tasmania. Others have been recorded from New Zealand and South America.

Gen. *Prosympiestus* Bergroth, 1894

Prosympiestus has four species distributed in Australia and Tasmania, of which three were represented in this lot. *Prosympiestus* has a curious scent gland opening in the form of a pit with a stiff seta in it. Other genera of this subfamily have the normal scent gland opening similar to Isoderminae.

1. *Prosympiestus nasutus* Bergroth

Prosympiestus nasutus Bergroth, 1894, Ent. Tidskr.; 15: 117.

1 ♂, Tasmania, Waratah—Lea coll.; 1 ♂, Tasmania, Wilmot—Lea & Carter coll.

2. *Prosympiestus subparallelus* Usinger and Matsuda

Prosympiestus subparallelus Usinger & Matsuda, 1959, Class. Aradidae; p. 66, fig. 23C.

1 ♀, S.A., Adelaide.

3. *Prosympiesius constrictus* Usinger and Matsuda

Prosympiestus constrictus Usinger & Matsuda, 1959, Class. Aradidae; p. 64, fig. 23A.

2 ♂ & 1 ♀, Tasmania, Wilmot—Lea & Carter coll.; 1 ♀, N.S.W., Dorrigo—W. Heron coll.

Subfamily ARADINAE Amyot and Serville, 1843

The Aradinae contain only a single cosmopolitan genus, *Aradus* F., 1803, distributed mostly in the Northern Hemisphere (Palearctic and Nearctic Regions).

Gen. *Aradus* Fabricius, 1803

From Australia and Tasmania only three species have been recorded to which I may add two species more, which are described elsewhere in this paper. All Australian species of *Aradus* belong to the "*lugubris* group", and are very good flyers. These species may be separated by the following key.

KEY FOR SEPARATION OF AUSTRALIAN SPECIES OF
THE GENUS *ARADUS* F.

1. 2nd antennal segment depressed longi-
tudinally 2
2nd antennal segment rounded, not depressed 3
2. 2nd antennal segment in the middle, 3rd
entirely, and 4th with exception of the tip,
white; lateral borders of the pronotum
irregularly denticulate *A. albicornis*
(Walker), 1873
Antennal segments II to IV are brown, or
light brown; the lateral borders of the
pronotum are very finely granulate, not
irregularly denticulate *A. fuscicornis* n. sp.
3. Antennal segment IV white; lateral borders
of the pronotum parallel *A. leucotelus*
(Walker), 1873
Antennal segment IV brown or black, never
white; lateral borders of the pronotum
more or less convergent from the middle
backward 4
4. Antennal segment II longer, longer than the
distance between eyes; antennal segment
III slightly depressed; antennae black, or
very dark brown *A. australis*
Erichson, 1842
Antennal segment II shorter, as long as the
distance between eyes; antennal segment
III rounded, tapering toward the base;
antennae light brown, antennal segment II
whitish in the middle, with brown base and
tip *A. erraticus* n. sp.

1. *Aradus albicornis* (Walker)

Fig. 1-2

Mezira albicornis Walker, 1873, Cat. Hem. Het. Brit. Mus., 7: 28.*Aradus albicornis* Distant, 1902, Ann. Mag. Nat. Hist., (7) 9: 358.

2 ♂, Tasmania, Launceston; 1 ♂, Tasmania, Ulverston—Lea coll.;
1 ♀, Queensland, Emerald—Lea coll.; 2 ♂, Northern Territory, 30 m.
East of Darwin—G. F. Hill coll.

2. *Aradus fuscicornis* n. sp.

Fig. 3-4

Male. Head longer than width through the eyes (δ —23:20.5, ♀—23:22). Anterior process strong, with parallel sides, rounded anteriorly, reaches to $\frac{2}{5}$ of antennal segment II. Antenniferous tubercles strong, dentiform, acute, slightly divergent, and slightly curved inward, reaching to $\frac{3}{5}$ of antennal segment I. Eyes large, globose; distance between eyes equal, or slightly larger than the length of ant. segment II (δ —12:12, ♀—13:12). Preocular tubercles distinct, acute; postocular blurred. Vertex with an "U" shaped, moderately deep depression; the white stripe behind the depression is clearly visible. Antennae less than one and a half times as long as the head (δ —29.5:23, ♀—28.5:23). Antennal segments II and III compressed; proportions, I to IV, are: δ —3:12:7.5:7, ♀—3.5:12:7:6. Rostrum reaching middle of prosternum.

Pronotum more than half as long as its maximal width (δ —20:38, ♀—21:38). Collar with two (1 + 1) high tubercles. Anterior angles with a tooth; lateral borders firstly convex, then sinuate, and finely denticulate, on the fore lobe; parallel, and finely crenulate, on the hind lobe. Pronotal carinae subparallel, or parallel, sometimes slightly convergent backward on the hind lobe. Interlobal depression deep.

Scutellum long, triangular (δ —30:18, ♀—25:18), raised in the middle anteriorly, and transversely depressed on the elevation along basal border; deeply concave, and transversely rugose behind elevation; lateral borders reflexed, straight, or slightly convex, tip acute.

Hemelytra reaching almost to the hind border of paratergites (δ), or to $\frac{3}{4}$ of tergum VIII (♀). Corium reaches to beyond fore border of connexivum VI (δ), or to $\frac{3}{4}$ of connexivum V (♀).

Abdomen longer than maximal width across segment V (δ —54:44, ♀—60:50). Length of the abdomen is taken from the beginning of connexivum II (the first visible) to the tip of paratergites. Lateral borders convex, more so in the female. PE-angles of connexiva not protruding.

Legs slender; fore femora thicker than antennal segment II.

Colour black; PE-angles of connexiva whitish; antennae, and tibiae, light brown; basal segment of tarsi whitish, apical light brown.

Total length: ♂—4.72, ♀—4.72 mm; width of pronotum ♂—1.52, ♀—1.52 mm; width of abdomen ♂—1.76, ♀—2.00 mm.

Holotype ♂, West Australia, Mullewa—Miss F. May coll.; deposited in the South Australian Museum, Adelaide.

Allotype ♀, S. Australia, Adelaide; in the same collection.

Paratypes: ♀, S. Australia, Murray R.—F. R. Zietz coll.; 1 ♀, S. Australia, Murray R.—H. S. Cope coll.; 1 ♀, S. Australia, Lucindale—Feuerheerdt coll.; 1 ♂, S. Australia; 1 ♀, S. Australia, Klemzig—E. T. Giles coll. 14.II.56; 1 ♀, Third C^a J. Jenning coll. 13.II.1901; 1 ♀, Queensland, Cunnamulla—H. Hardeastle coll.; 1 ♀, Queensland, Emerald—Lea coll., and 3 ♀, Kangaroo Is.

Aradus fuscicornis n. sp. belongs to “*lugubris* group”, and is related to *A. albicornis* (Walker), 1873, from which it may be separated as is indicated in the key. *A. fuscicornis* n. sp. was probably often confused with *A. australis* Erichson, 1842, from which it can be separated at once by compressed antennal segment II, and lighter antennae.

3. *Aradus leucotelus* (Walker)

Fig. 5-6

Mezira leucotela Walker, 1873, Cat. Hem. Het. Brit. Mus., 7: 28.

Aradus antennatus Distant, 1902, Ann. Mag. Nat. Hist., (7) 9: 558.

Aradus leucotelus Kormilev, 1965, Proc. R. Soc. Queensland, 77: 13.

1 ♀, S. Australia, Mt. Lofty; 1 ♀, N.S.W., Dorrigo—W. Heron coll.

4. *Aradus australis* Erichson

Fig. 7-10

Aradus australis Erichson, 1842, Arch. Nat. Ges., 8: 281.

It is the commonest Australian species of the genus *Aradus* F. The shape of pronotum is rather variable: in specimens from the Australian mainland the lateral borders of the hind lobe of pronotum are only slightly convergent backward, whereas in the specimens from Tasmania this convergence is much more pronounced.

1 ♂ & 1 ♀, N.S.W., Dorrigo; 1 ♀, N.S.W., Dorrigo—W. H. Heron coll.; 1 ♂ & 3 ♀, Tasmania, Launceston 3 ♂ and 1 ♀ Tasmania, Launceston—Lea coll.; 1 ♀, Tasmania, Cradle Mts.—Carter and Lea coll.; 1 ♀, Tasmania, Hobart—Lea coll., and 1 ♀, Tasmania, name of locality illegible.

5. *Aradus erraticus* n. sp.

Fig. 11-12

Female. Closely related to *A. australis* Erichson, 1842, but smaller; antennae relatively shorter; antennal segment II only as long as the distance between eyes; antennal segment III rounded, tapering toward the base, where as in *A. australis* it is slightly compressed longitudinally. Corium reaches to the fore border of connexivum VI (produced over this border in *A. australis*). Other characters in both species are similar: shape of pronotum, scutellum, and abdomen. Colour also is the same, with exception of antennae, which are brown, segment II whitish in the middle (black, or very dark brown in *A. australis*).

Table of Comparative Measurements in Both Species.

	<i>A. erraticus</i> n. sp. ♀	<i>A. australis</i> Erich. ♀
Head	20:22	26:24
Distance between eyes . . .	12.5	14
Proportions of ant. seg. . .	4:12.5:7.5:7	5:18.5:9:7.5
Pronotum	21:40	26:50
Scutellum	25:18	30:23
Abdomen	57:49	71:59
Total length	4.5 mm	5.52 mm

Holotype ♀, Queensland, Yorke Is. in the Torres Straits—C. T. McNamara coll.; deposited in the South Australian Museum, Adelaide.

Subfamily CALISIINAE Stål, 1873

Calisiinae show a curious mixture of very primitive and rather advanced characters. Among the four genera now recorded for the subfamily, *Paracalisiopsis* Kormilev, 1963, is the most primitive, *Aradacanthia* Costa, 1864, the most advanced. As primitive characters Calisiinae have:—connexivum I, which is superimposed on connexivum II as a small, triangular sclerite (in *Paracalisiopsis* it is completely developed and placed in front of connexivum II); chitinated tergum VIII in the males, which is discernible as a small sclerite in all four genera. As advanced characters should be mentioned: highly developed scutellum, covering most of hemelytra, and also the tergum up to tergum VII (in *Calisius intervenius* Bergroth, 1894, there may be observed a secondary reduction of the scutellum, which leaves tergum VI exposed); a notable reduction of corium, with corresponding reduction of venation in the membrane; a double row of granules on exterior borders of connexiva (in *Paracalisiopsis* these rows have

disappeared, and are substituted with flat teeth); moniliform first three antennal segments, and enlarged, granulate segment IV in *Calisiopsis* Champion, 1898, and *Paracalisiopsis* Kormilev.

Of the four genera *Calisius* Stål is almost circumtropical, penetrating into subtropical, and even into temperate areas in the Palaearctic. *Calisiopsis* Champion is American (Neotropical); *Aradacanthia* Costa Oriental, and *Paracalisiopsis* Kormilev is Ethiopian. In Australia only *Calisius* Stål is represented.

Gen. *Calisius* Stål, 1860

Calisius Stål has to date 45 described species, of which one is fossil from the Baltic amber; to these I can now add five more species. As all species of *Calisius* are small to very small (2.2 to 5.0 mm maximum) and as such are difficult to collect we consequently know almost nothing about their habitat. Occasionally single specimens have been found sitting on a leaf, or on a wall. Matsuda and Usinger indicate that they live in foliage and dead branches of trees.

The distribution of the 50 known species of the genus *Calisius* shows firstly, that each species is limited to a relatively small area, and secondly, that the genus as a whole is not spread over an uninterrupted area, but forms five belts, which are not in contact with each other. The first belt, in the Palaearctic, stretches along the Mediterranean sea into Central Asia (Tadjikistan). The second belt, in the Ethiopian region stretches across tropical Africa, from Senegal to Seychelles. It is separated from the first by the desert belt. The third belt, Central American, stretches from Bahamas, and Lesser Antilles to Central America, and Northern South America. The fourth belt, South American, stretches from S.E. Brazil to North Argentina and Bolivia. It is possible that the third and the fourth belts will be later united, but so far they are separated by the Amazon basin. The fifth belt, West Pacific, stretches from the Mariana Islands southward, across the Carolines, New Guinea, Fiji, Norfolk Island, to Australia and Tasmania. Usinger and Matsuda record *Calisius* in New Zealand, but so far no species has been described from there (1959: 44). Such a curious pattern of distribution suggests that the genus previously was distributed all around the tropics, and later started to shrink, and split in a few separate areas.

LIST OF SPECIES OF THE GENUS *CALISIUS* STÅL, 1860

I Belt—Palaearctic.

1. *Calisius balticus* Usinger, 1941, fossil, in Baltic amber.
2. *Calisius ghiliani* Costa, 1864, France, Italy, Algeria.
3. *Calisius sabicis* Horvath, 1913, Yugoslavia, Syria.

4. *Calisius turanicus* Kiritshenko, 1959, Russian Central Asia (Tadjikistan).

II Belt—Ethiopian.

5. *Calisius schoutedeni* Hoberlandt, 1954, Senegal.
6. *Calisius lativentris* Horvath, 1913, Cameroun.
7. *Calisius nypelsi* Schouteden, 1919, Cameroun.
8. *Calisius horvathi* Schouteden, 1952, Congo.
9. *Calisius slappersi* Schouteden, 1919, Congo.
10. *Calisius verruciger* Horvath, 1913, Kenya.
11. *Calisius seychellensis* Kormilev, 1963, Seychelles Is.

III Belt—Central American.

12. *Calisius affinis* Barber, 1954, Bahamas Is. (Bimini).
13. *Calisius contubernalis* Bergroth, 1913—Lesser Antilles (Guadeloupe), Florida.
14. *Calisius elegantulus* Bergroth, 1913, Guadeloupe.
15. *Calisius anaemus* Bergroth, 1913, Florida.
16. *Calisius farri* Kormilev, 1964, Jamaica.
17. *Calisius gracilis* Kormilev, 1959, Guatemala.
18. *Calisius insignis* Kormilev, 1959, Guatemala.
19. *Calisius ferox* Champion, 1898, Panama.
20. *Calisius longiventris* Kormilev, 1959, Panama.
21. *Calisius major* Bergroth, 1913, Venezuela.

IV Belt—South American.

22. *Calisius pallipes* Stål, 1860, S.E. Brazil.
23. *Calisius placidus* Horvath, 1913, S.E. Brazil.
24. *Calisius confusus* Kormilev, 1953, S.E. Brazil, North Argentina.
25. *Calisius bilobatus* Kormilev, 1959, Bolivia.

V Belt—West Pacific.

26. *Calisius saipanensis* Matsuda & Usinger, 1957, Marianas (Saipan).
27. *Calisius tinianensis* Matsuda & Usinger, 1957, Marianas (Tinian).
28. *Calisius dilaticeps* Usinger, 1946, Marianas (Guam).
29. *Calisius infuscalus* Matsuda & Usinger, 1957, Marianas (Guam).
30. *Calisius longicornis* Matsuda & Usinger, 1957, Carolines (Ponape).
31. *Calisius trukensis* Matsuda & Usinger, 1957, Carolines (Truk).
32. *Calisius acutus* Matsuda & Usinger, 1957, Carolines (Palau).
33. *Calisius araklai* Esaki & Matsuda, 1951, Carolines (Palau).
34. *Calisius micronesicus* Matsuda & Usinger, 1957, Carolines (Palau).
35. *Calisius antennalis* Horvath, 1913, N.E. New Guinea.
36. *Calisius cognatus* Horvath, 1913, N.E. New Guinea.
37. *Calisius notabilis* n. sp., N.E. New Guinea.
38. *Calisius papuanus* Horvath, 1913, N.E. New Guinea.
39. *Calisius picturatus* Horvath, 1913, N.E. New Guinea.

40. *Calisius magdalenae* n. sp., Fiji.
41. *Calisius pacificus* Kirkaldi, 1908, Fiji.
42. *Calisius leai* n. sp., Norfolk Is.
43. *Calisius australis* Kormilev, 1959, Australia (Queensland).
44. *Calisius grossi* n. sp., Australia (Queensland).
45. *Calisius hackeri* Kormilev, 1959, Australia (Queensland).
46. *Calisius intervenius* Bergroth, 1894, Australia (S. Australia).
47. *Calisius septimus* n. sp., Australia (S. Australia).
48. *Calisius annulicornis* Bergroth, 1913, Australia (Tasmania).
49. *Calisius lasmanicus* Kormilev, 1963, Tasmania.
50. *Calisius spinulosus* Blöte, 1965, Java.

KEY FOR SEPARATION OF AUSTRALIAN SPECIES OF THE GENUS *CALISIUS* STÅL

1. Anterior process of the head narrowly trapezoidal, tapering toward the base; its tip is rounded, granulate, and incised in the middle; lateral borders straight, and smooth *C. grossi* n. sp.,
Queensland
- Anterior process of the head obovate; its lateral borders convex, and granulate . . . 2
2. Larger species, over 4.0 mm; antennal segment III is whitish, other segments brown, or dark brown; segment III is distinctly longer than II (5.5:4) *C. annulicornis*
Bergroth, 1913.
S.A., Tas.
- Smaller species, less than 3.5 mm; antennal segment III is concolorous with I and II, and is as long, or only slightly longer, than II 3
3. Scutellum short, leaving tergum VI exposed in both sexes *C. intervenius* Bergroth, 1894, S.A.
- Scutellum longer always covering tergum VI 4
4. Antennal segment III subcylindrical, tapering toward the base; white band of the scutellum in the shape of two divergent hooks, united by their bases, and forming an angle; median carina of scutellum with sharp, erect granules *C. australis* Kormilev,
1959, Qld.

- Antennal segment III ovate; white band of the scutellum in the shape of an inverted "V"; median carina of scutellum with a rounded, and somewhat blurred granulation 5
5. Antennae robust, longer than width of the head through the eyes; white band of scutellum is clear white, very conspicuous *C. tasmanicus* Kormilev, 1963, Tas.
- Antennae slender, and shorter, at most as long as width of the head through the eyes; white band of the scutellum yellowish, and less conspicuous 6
6. Side strips of white band narrower; its tip placed at $\frac{1}{4}$ of scutellum's length *C. septimus* n. sp., S.A.
- Side strips of white band wider; its tip placed more posteriorad, at $\frac{1}{3}$ of scutellum's length *C. hackeri* Kormilev, 1959, Qsld.

1. *Calisius grossi* n. sp.

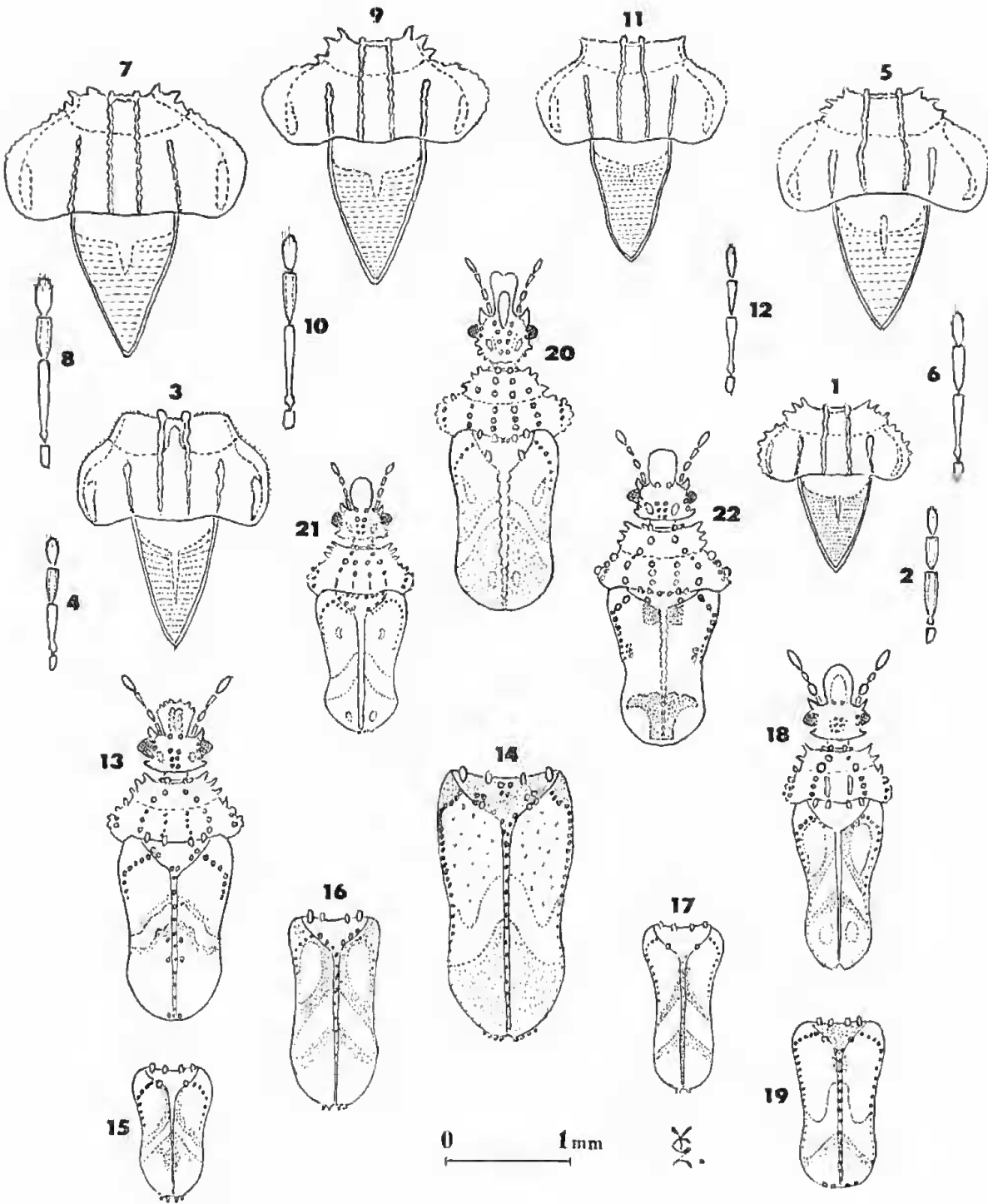
Fig. 13

Female. Elongate ovate, partially covered with erect, blunt granules.

Head as long as width through the eyes (16.5:16.5). Anterior process narrowly trapezoidal; its lateral borders straight, smooth, and convergent posteriorly; its tip rounded, granulate, and incised in the middle, reaching to the middle of antennal segment III. Antenniferous tubercles dentiform, subacute, with almost parallel outer borders, not

EXPLANATION OF DRAWINGS

- Aradus albicornis* (Walker), ♀, Fig. 1—pronotum and scutellum; Fig. 2—antenna.
- Aradus fuscicornis* n. sp., ♀, Fig. 3—pronotum and scutellum; Fig. 4—antenna.
- Aradus leucotelus* (Walker), ♀, Fig. 5—pronotum and scutellum; Fig. 6—antenna.
- Aradus australis* Erichson, ♀ from N.S.W., Fig. 7—pronotum and scutellum; Fig. 8—antenna; ♀ from Tasmania (other extreme), Fig. 9—pronotum and scutellum; Fig. 10—antenna.
- Aradus erraticus* n. sp., ♀, Fig. 11—pronotum and scutellum; Fig. 12—antenna.
- Calisius grossi* n. sp., ♀, Fig. 13—head, pronotum and scutellum.
- Calisius annulicornis* Bergroth, ♀, Fig. 14—scutellum.
- Calisius interveniens* Bergroth, ♀, Fig. 15—scutellum.
- Calisius tasmanicus* Kormilev, ♂, Fig. 16—scutellum.
- Calisius hackeri* Kormilev, ♀, Fig. 17—scutellum.
- Calisius septimus* n. sp., ♀, Fig. 18—head, pronotum and scutellum.
- Calisius australis* Kormilev, ♀, Fig. 19—scutellum.
- Calisius magdalenae* n. sp., ♂, Fig. 20—head, pronotum and scutellum.
- Calisius leai* n. sp., ♂, Fig. 21—head, pronotum and scutellum.
- Calisius notabilis* n. sp., ♀, Fig. 22—head, pronotum and scutellum.



Figs. 1-22.

quite reaching to the tip of antennal segment I. Eyes protruding, reniform, but not pedunculate. Postocular tubercles formed by a small granule, not attaining the outer borders of the eyes by a considerable amount. Vertex with a blunt, "V"-form granulation. Antennae slender, longer than width of the head through the eyes (19.5:16.5); segments I and II ovate, III more slender, and tapering toward the base, IV fusiform; proportions, I to IV, are: 3:3:3.5:5.

Pronotum half as long as its maximal width (15:29). Fore lobe with four (2 + 2) parallel, blunt tubercles, and in addition two (1 + 1) smaller ones somewhat laterally placed to the former, and near the hind border of fore lobe. Lateral borders of fore lobe with a few long, blunt spicules, directed sideways. Hind lobe much wider and higher than fore lobe, with six (3 + 3) rows of smaller, blunt tubercles; the disc between them is finely punctured.

Scutellum large, long, and wide (36:22) reaching almost to hind border of tergum VI; basal elevation relatively small, and high, with four (2 + 2) rows of tubercles: each outer row made up of one large tubercle, each inner row made up of two somewhat smaller tubercles. Median carina high, and granulate; with a small cluster of granules at the base, and a single row (intermittently) of more elevated than lower granules more posteriorly. At the base of scutellum laterally run two (1 + 1) arcuate, dense rows of smaller tubercles, reaching to $\frac{1}{2}$ of scutellum's length. Along the middle portion of median carina are located on both sides a few smaller, and more distant, tubercles. Disc roughly and densely punctured.

Hemelytra are visible only as a row of dense, blunt granules.

Abdomen longer than width across segment IV (43:34). In this, and the following species of the genus *Calisius*, the length of abdomen is taken from fore border of connexivum I to the tip of abdomen. Connexivum wide and reflexed; connexiva are wider than their length: outer borders of connexiva with a double row of blunt tubercles; each connexivum from II to VII bears in each row two smaller, dark tubercles, and one larger whitish one. Connexivum I is small, triangular, superimposed on connexivum II. Tergum VII (♀) in a form of an inverted trapezoid. Segment IX is long, much longer than small paratergites. Spiracles from II to VI are ventral, and not visible from above; VII lateral, placed on a large tubercle, and VIII terminal.

Colour: pale testaceous; scutellum on the hind half mottled with creamy-yellow: inverted "V" band is also creamy-yellow, and somewhat blurred.

Total length, 3.12 mm; width of pronotum, 1.16 mm; width of abdomen, 1.36 mm.

Holotype: ♀, Australia, Queensland, Cairns district—A. M. Lea coll.; deposited in the South Australian Museum, Adelaide.

It is a pleasure to dedicate this species to Mr. Gordon F. Gross, Senior Curator of Invertebrates in the South Australian Museum, by whose kind offices I have been privileged to study this important, and interesting, lot of Aradidae in his charge.

Calisius grossi n. sp. is very different from all Australian species of *Calisius*, and may be separated from them at once by the shape of anterior process of the head, and colour; its antennae somewhat resemble those of *C. australis* Kormilev, 1959, but the shape of the body, head, and colour, are quite different.

2. *Calisius annulicornis* Bergroth

Fig. 14

Calisius annulicornis Bergroth, 1913, The Can. Ent., **45**: 9.

1 ♂, South Australia, Lucindale—Fenerheerdt coll.

3. *Calisius intervenius* Bergroth

Fig. 15

Calisius intervenius Bergroth, 1894, Ent. Tidskr., **15**: 97.

1 ♂ & 5 ♀, South Australia, Mt. Lofty Rgs.; 1 ♂ & 2 ♀, S.A., Mt. Lofty Rgs.—S. H. Curnow coll.; 1 ♂ & 1 ♀, S.A., Mt. Lofty—Tepper coll. 14.VII.1884; 4 ♂, S.A., Mt. Lofty, Second Creek—Tepper coll. 4.XI.1884; 1 ♂ & 1 ♀, S.A., Second Creek—Tepper coll. 9.X.1886; 2 ♂ & 2 ♀, Magill—Tepper coll. 7.VII.1884; 2 ♂, S.A., Mt. Lofty—Tepper coll. 11.IX.1887; 1 ♂ & 2 ♀, Mt. Torrens—Oct. 1916; 1 ♂ & 1 ♀, Victor Harbour—H. Womersley coll. Jan. 1934; 1 ♀, S.A., Lucindale—Fenerhardt coll.; 2 ♂ & 1 ♀, Clarendon (under bark of *Eucalyptus*); 1 ♀, S.A., Kangaroo Is.—A. M. Lea coll.

4. *Calisius tasmanicus* Kormilev

Fig. 16

Calisius tasmanicus Kormilev, 1963 (1962), Ann. Mag. Nat. Hist.; Ser. 13, **5**: 604, figs. 3-5.

2 ♂, Tasmania, Hobart—A. M. Lea coll.; 1 ♂, Tasmania, Huon R.—A. M. Lea coll.; 2 ♂, Tasmania—A. Simson coll.; 1 ♂, St. Marys.

5. *Calisius hackeri* Kormilev

Fig. 17

Calisius hackeri Kormilev, 1959 (1958), Proc. U.S. Nat. Mus.; **109** (No. 3413): 219, fig. 13-14.

1 ♂, Australia—Blackb's coll.; 2 ♂, Flinders Range—E. L. Savage coll.; 2 ♀, Mt. Serle, N. Flinders Range—Hale & Tindale coll.; 2 ♂, S.A., Quorn.

6. **Calisius septimus** n. sp.

Fig. 18

Female. Elongate ovate; closely related to *C. hackeri* Kormilev, 1959, from which it may be separated as is indicated in the key. In other characters, and colour, they are pretty similar.

Measurements: head almost as long as width through the eyes (15:14); proportions of antennal segments, I to IV, are 2.5:3:3:5.5; pronotum half as long as its maximal width (12:23); scutellum much longer than its maximal width (33:18); abdomen longer than its maximal width (40:26).

Total length, 3.0 mm; width of pronotum, 0.92 mm; width of abdomen, 1.04 mm.

Holotype: ♀, South Australia, Pt. Lincoln—A. M. Lea coll.; deposited in the South Australian Museum, Adelaide.

Paratype: 1 ♀, Clarendon—Tepper coll. 19.IV.1884; in the collection of the author.

7. **Calisius magdalenae** n. sp.

Fig. 20

Male. Elongate ovate, partly covered with rough, blunt granules.

Head longer than width through the eyes (♂—17.5:15.5, ♀—17.5:16). Anterior process long, with parallel sides, anteriorly flattened, and incised in the middle of fore border, reaching almost to the tip of antennal segment III. Antenniferous tubercles dentiform, acute, divergent, reaching almost to the tip of antennal segment I. Eyes, small, semiglobose, very protruding, but not pedunculate. Post-ocular tubercles consist of 2 or 3 small granules, not reaching to the outer border of the eyes by quite a large amount. Vertex with "V"-shape rough granulation. Antennae short, and slender, slightly shorter than width of the head through the eyes (♂—14.5:15.5, ♀—15:16); first two segments subcylindrical, 3rd tapering toward the base, 4th fusiform; proportions of the antennal segments, I to IV, are: ♂—2.75:2.75:3.75:5, ♀—2.75:2.75:4:5.5. Rostrum short, does not reach to the base of rostral groove.

Pronotum half as long as maximal width (♂—14:29, ♀—15:31). Collar distinct, with two (1 + 1) small granules on upper side. Fore lobe convex, with two transverse rows of rough granules: two (1 + 1) in the front row, and four (2 + 2) in the hind row. Lateral borders provided with 3 or 2 rough, blunt spicules. Interlobal depression

narrow and deep. Hind lobe much wider, and higher than fore lobe, provided with six ($3 + 3$) longitudinal rows of granules, divergent backward: four rows on the disc, and two along the humeri.

Scutellum longer than its maximal width (δ —34:22, φ —39:22). Lateral borders slightly sinuate in the middle; hind border subtruncate. Basal, triangular elevation is rather small, but high; provided with four ($2 + 2$) rough granules, placed along basal border, and slightly overlapping the hind border of pronotum. Median carina is high, and thick at the base, but rapidly tapering, and becoming lower toward the tip; granulation of carina is blunt, dense, and low. Two ($1 + 1$) arcuate rows of granules near the base are fine, and rather short, gradually disappearing behind the level of connexivum I. Lateral borders of hind half, and the tip of scutellum, are carinate, but without granules. Disc roughly punctured, particularly rough on the hind half.

Hemelytra seen as narrow carinae, with blurred granulation; corium reaches to connexivum IV.

Abdomen longer than its maximal width (δ —42:33, φ —44:39). Connexivum wide, and slightly reflexed; connexiva wider than their length. Lateral borders with a double row of rough, blunt granules, particularly rough in the female; each connexivum has two granules (one black, and one white) in the upper row, and three granules (two black, and one white) in the lower row. Tergum VII in the male is raised in the middle for reception of hypopygium; tergum VIII in the male is seen as a narrow border behind, and a little below tergum VII. Hypopygium is ventro-caudal in position; paratergites small and blunt. Tergum VII in the female is flat, and rather smooth, with small granules along the fore, and hind, borders; paratergites bicuspidate, short; segment IX long, and narrow, tricuspidate at the tip. Spiracles ventral from II to VI; lateral, placed on granule on VII; terminal on VIII.

Colour: dark reddish brown to black; clypeus, and vertex, with pinkish tinge; scutellum with two ($1 + 1$), anteriorly contiguous, "S"-shaped, whitish spots, forming a kind of an inverted "U"; in the antero-lateral angles of scutellum two ($1 + 1$) elongate, whitish spots, and near the tip, along median carina, two ($1 + 1$) more, small, whitish spots. Connexivum I whitish. Antennae greyish brown, progressively becoming lighter toward the tip; ant. segment IV is pale brown to whitish. Legs ochraceous; bases of femora brown.

Total length: δ —3.2, φ —3.4 mm; width of pronotum: δ —1.16, φ —1.24 mm; width of abdomen: δ —1.32, φ —1.56 mm.

Holotype: δ , Fiji, Savu Savu, Vanua Levu—A. M. Lea coll.; deposited in the South Australian Museum, Adelaide.

Allotype: ♀, collected with the holotype; in the same Museum.

Paratypes: 2 ♂, collected with the holo, and allotype; in the same collection, and collection of the author.

It is a pleasure to dedicate this striking species to my wife, Mrs. Magdalena Kormilev, as a sign of my gratitude to her constant help in my entomological work.

Calisius magdalenae n. sp. is related to *C. tinianensis* Matsuda & Usinger, 1957, from Tinian, Mariana Is. from which it differs by anteriorly more dilated, and flattened anterior process of the head; different proportions of antennal segments, and larger size.

8. *Calisius leai* n. sp.

Fig. 21

Male. Elongate ovate, rather convex; partially finely granulate.

Head as long as width through the eyes (12.5:12.5). Anterior process robust, high, with slightly convex sides, its tip is rounded, reaching slightly over the tip of antennal segment II. Antenniferous tubercles small, dentiform, acute, their outer borders parallel; reaching almost to the tip of antennal segment I. Eyes moderately large, semiglobose, protruding. Postocular tubercles consist of a few very small, whitish granules, reaching or almost reaching to the outer border of the eyes. Vertex with "V"-shaped granulation, and laterad of it two (1 + 1) rows of smaller granules. Antennae short, and very slender, shorter than the head's width through the eyes (11.5:12.5). Antennal segment I subcylindrical, II and III tapering toward the base, IV fusiform. Proportions, I to IV, are: 2.5:2.5:2.5:4. Rostrum reaching to the hind border of rostral groove.

Pronotum half as long as its maximal width (10:21), and strongly declivous forward. Interlobal depression narrow, and shallow. Collar with two (1 + 1) erect, small granules. Fore lobe with two (1 + 1) granules placed behind those of the collar, and two more, more widely apart, placed near hind border. Lateral borders each with three inclined spicules. Hind lobe is wider and higher than fore lobe, provided with six (3 + 3) rows of granules: the inner ones have two (1 + 1) erect granules near fore border, and behind them very thin, and low, finely granulate carinae. Middle rows have six (3 + 3) small granules, and outer rows, running along humeri, have four (2 + 2) larger granules, disc between granules is very finely punctured.

Scutellum is longer than its maximal width (28:17); its lateral borders sinuate at the middle, apical border rounded. Basal, triangular elevation is small, and moderately high; at its foreborder are placed

eight small granules; in the middle of lateral borders are placed two ($1 + 1$) granules more. Median carina is thin, and high, finely granulate. Lateral of the basal elevation are placed two ($1 + 1$) arcuate rows of fine granules, reaching laterally a little over connexivum I; further backward lateral borders of the scutellum are carinate, but without granulation. Disc densely, and moderately rough punctured.

Hemelytra are seen as carinae, reaching to the hind border of connexivum IV.

Abdomen longer than its maximal width (28:23.5); connexivum narrow (connexiva are longer than their width); lateral borders with a double row of very fine granules, three on each connexivum; these granules are almost evanescent in the lower row. Connexivum I in the shape of a whitish triangle, superimposed on connexivum II. On connexivum VII granules are larger than on II to VI. Tergum VIII very short, with four ($2 + 2$) small granules at the hind border. Hypopygium small, ventro-caudal in position. Spiracles very small, II to VI ventral; VII placed on tubercles, VIII lateral.

Colour: brown to dark brown; granulations on vertex, basal row on the scutellum, and connexivum VII, are whitish; inverted "V" band of the scutellum is also whitish. Four spots ($2 + 2$) in front, and behind inverted "V"-band, light brown. Antennal segment I to III are brown, IV piceous; femora piceous with whitish tips; tibiae, and tarsi whitish.

Total length, 2.28 mm; width of pronotum, 0.84 mm; width of abdomen, 0.94 mm.

Holotype: ♂, South Pacific, Norfolk Is.—A. M. Lea coll.; deposited in the South Australian Museum, Adelaide.

This species is dedicated to Mr. A. M. Lea, who was an excellent collector, and collected many species on Fiji, South Pacific Islands, Tasmania, and Australia.

Calisius leui n. sp. is somewhat related to *C. acutus* Matsuda & Usinger, 1957, from which it differs by: different proportions of the antennal segment; by a very narrow connexivum; by an almost evanescent granulation in the lower row on the borders of the connexivum and by a different colour.

9. *Calisius notabilis* n. sp.

Fig. 22

Female. Elongate ovate; upper surface covered with a very thin, white incrustation.

Head slightly longer than width through the eyes (15:13.5).

Anterior process robust, obovate, rounded anteriorly, and slightly convex laterally, reaching to the middle of antennal segment III. Antenniferous tubercles tiny, acute, slightly divergent, not quite reaching the tip of antennal segment I. Eyes large, subconical, protruding. Postocular tubercles tiny, dentiform, do not reach to the outer border of the eyes; behind, and mesad, of them are placed four ($2 + 2$) small granules. Vertex with two ($1 + 1$) contiguous rows of tubercles, three in each row. Antennae slender, and short, distinctly shorter than the head (12:15). Antennal segment I subcylindrical, II ovate, III tapering toward the base, IV fusiform; proportions, I to IV, are: 2:2.5:2.5:5. Rostrum reaches to the base of the head.

Pronotum rather flat; half as long as its maximal width (12.5:25). Collar high, distinctly separated from the disc by a thin, and deep sulcus, and provided with two ($1 + 1$) larger granules. Lateral borders of the fore lobe with six ($3 + 3$) larger, blunt spicules, which are larger than granules on the hind lobe. Fore disc with four ($2 + 2$) granules: two ($1 + 1$) of them placed behind those of the collar, and two ($1 + 1$) more laterad, and more backward of them. Hind disc with six ($3 + 3$) rows of three granules each; the inner rows are parallel; the middle ones slightly convex exteriorly, and the outer ones run across humeri.

Scutellum much longer than its maximal width (32:20). Six ($3 + 3$) granules placed along basal border, of which the inner ones are smaller; two ($1 + 1$) granules more are placed at lateral borders. Basal, triangular elevation is small, moderately high; median carina thin, relatively low, granulate; lateral, arcuate rows ($1 + 1$) of progressively diminishing granules reach laterally to the middle of connexivum V. Disc finely punctured.

Hemelytra with corium reaching to hind border of connexivum IV.

Abdomen longer than its maximal width across segment IV (36:29). Connexivum moderately reflexed; exterior borders of connexiva with a double row of granules, which are as large as those on the hind disc of pronotum. Spiracles ventral from II to VI; lateral, placed on a small tubercle, on VII; lateral on VIII. Paratergites small, each bearing two granules; segment IX narrow, moderately long, very slightly incised at the tip.

Colour: pale greyish-ochraceous; eyes black. Black spots: two ($1 + 1$) transverse spots along border of pronotum, between inner and middle rows of granules; triangular elevation of scutellum (the black colour is concealed by white incrustation, and looks grey); two ($1 + 1$) quadrangular spots at the base of the median carina of scutellum; two ($1 + 1$) small streaks at the middle of the lateral

borders of scutellum; two (1 + 1) larger spots in the shape of an inverted "L", together forming a "T"-shaped large spot at the tip of scutellum. Basal half of connexivum II, and the middle granule in the upper row of connexia III to VII; one median spot at the hind border of tergum VII; the middle of tergum VIII, and the base of segment IX, are also all black. Antennae, legs, and the ventral side of the body greyish-ochraceous.

Total length, 2.8 mm; width of pronotum, 1.0 mm; width of abdomen, 1.16 mm.

Holotype: ♀, New Guinea, Finsch Haven—Rev. L. Wagner coll.; deposited in the South Australian Museum, Adelaide.

Calisius notabilis n. sp. is related to *C. cognatus* Horvath, 1913, also from New Guinea, and may be separated from the latter by different proportions of antennal segments (segment IV is twice as long as III, as long as II and III together), and by a different pattern of black spots on the scutellum.

Subfamily ANEURINAE Douglas and Scott, 1865

There are only two genera of Aneurinae: *Aneurus* Curtis, 1825, a cosmopolitan genus, and *Aneuraptera* Usinger and Matsuda, 1959, with a single, micropterous species from New Zealand.

Gen. *Aneurus* Curtis, 1825

Five species have been recorded from Australia. The species may be separated by the following key:—

KEY TO AUSTRALIAN SPECIES OF THE GENUS *ANEURIS* CURTIS

1. PE-angles of connexiva II to VI distinctly produced, forming an angle *A. angulatus*
Kormilev 1965
- PE-angles of connexiva not produced 2
2. Antennal segment III subcylindrical 3
- Antennal segment III regularly tapering toward the base 4
3. Antennal segment III more than twice as long as II; terga IV and V in the male provided with small tubercles, absent in the female *A. androphymus*
Bergroth, 1914
- Antennal segment III subequal in length to II; male without tubercles on terga IV and V *A. robustus*
Kormilev, 1957

4. Antennal segment III distinctly longer than II (4:3); larger species, over 5 mm *A. australicus* Stål, 1873
- Antennal segment III as long as II; smaller species, 4 mm or less, exceptionally females may reach 5 mm *A. crenulatus* Kormilev, 1957

1. *Aneurus australicus* Stål

Aneurus australicus Stål, 1873, Enum. Hemipt., **3**: 146.

2 ♀, South Australia, Lucindale—Feuerheerdt coll.; 1 ♂, S.A., Lucindale—F. Secker coll.; all three specimens are mutilated.

2. *Aneurus crenulatus* Kormilev

Aneurus crenulatus Kormilev, 1957, Quarterly Jour. Taiwan Museum, **10**: 45.

2 ♂, New South Wales, Sydney—Lea coll.; 1 ♀, S.A., Lucindale—Feuerheerdt coll., the latter is abnormally large, 5 mm, whereas normally females of this species are about 4 mm long.

3. *Aneurus robustus* Kormilev

Aneurus robustus Kormilev, 1957, Quarterly Jour. Taiwan Museum, **10**: 44.

This is the commonest species in Eastern Australia, particularly in Queensland and New South Wales.

4 ♂, New South Wales, Dorrigo—W. Heron coll.; 7 ♂, 2 ♀, & 5 nymphs, N.S.W., Upper Williams R.—Lea & Wilson coll. N.1926; 2 ♂ & 5 ♀, Queensland, Mt. Tambourine—A. M. Lea coll.; 2 ♀, Kuranda—F. P. Dodd coll.

4. *Aneurus micronesicus* Esaki and Matsuda

Aneurus micronesicus Esaki and Matsuda, 1951; Mushi, **22**: 83.

Described from Caroline Islands, now recorded from Papua.

3 ♂, New Guinea, N.E. Papua, Mt. Lamington, 1,300-1,500ft.—C. T. McNamara coll.

5. *Aneurus cetratus* Bergroth

Aneurus cetratus Bergroth, 1894, Ann. Mus. St. Nat., Genova, **34**: 112.

Described from New Guinea, later recorded from the Philippine Islands, Sumatra, and Java; and here recorded from the Malay Peninsula.

2 ♂, Malaysia, Malay Peninsula, Gap, Fraser's Hill—A. M. Lea & wife coll.

Subfamily CARVENTINAE Usinger, 1950

Gen. *Carventus* Stål, 1865

The genus *Carventus* Stål also has a very wide range of distribution: from Burma, across Indonesia, and New Guinea, to Australia, then again in the Pacific Islands (Samoa). One species occurs in Central America (Mexico), and a few species in tropical Africa, and Madagascar. Ethiopian, and Malagasian species previously were placed in the genus *Burgeonia* Schönten, 1919; later this genus was synonymized with *Carventus* Stål, by Usinger and Matsuda (1959: 118). The genus *Camerarius* Distant, 1902 also was synonymized with *Carventus* by the same authors (1959: 120), though both these genera could perhaps be retained as subgenera, as they have been treated by this author, but it is difficult to say without a thorough revision. It is interesting to note, that half of all species of the genus *Carventus* Stål, recorded from the Oriental Region and the Pacific Islands, come from New Guinea and adjacent islands.

1. *Carventus malayensis* n. sp.

Fig. 23

Female. Elongate ovate, covered with brownish incrustation.

Head as long as width through the eyes (22.5:22.5), but shorter than width across postocular tubercles (22.5:26). Anterior process strong, slightly constricted in the middle, and incised in front, reaches to $\frac{3}{4}$ of antennal segment I. Antenniferous tubercles strong, dentiform, acute, divaricating, provided with a small tubercle on exterior border near the base, reaching to $\frac{1}{4}$ of antennal segment I. Eyes moderately large, protruding. Postocular tubercles dentiform, adjacent to the eyes, produced far beyond the outer border of the eyes. Vertex with a high, granulate, median carina, and two (1 + 1) lower, and thinner, smooth carinae laterad of the median. Postocular borders carinate, and sinuate, terminating with a tubercle directed backward. Antennae are one and a half times as long as the head (37:22.5); antennal segment I clavate; II and III tapering toward the base; IV elongate fusiform. Proportions, I to IV, are: 10.5:7:10:9.5. Rostrum reaches to the hind border of rostral groove.

Pronotum shorter than width across the humeri (27:47), distinctly divided into two lobes by a deep, and wide, depression. Collar clearly separated from the disc. Just behind the collar is placed a crescent-shaped, transverse ridge; and behind the latter a short, thin median sulcus, terminated with a tubercle placed in the interlobal depression. Antero-lateral angles produced as lobes, rounded anteriorly, and laterally, separated from the collar by a deep incisure. Along the fore

border of the lobes runs a granulated ridge, and another one, crescent-shaped, is placed behind the latter, and along the lateral border of fore lobe. Lateral borders twice, deeply sinuate, and with a strong tooth between them. Hind lobe much wider than the fore lobe (47:38), raised at humeri, and declivous anteriorly; along the hind border runs a fine, transverse sulcus. Lateral borders of hind lobe strongly convex, and with a tubercle in the middle. Hind border straight in the middle, angularly produced laterad of scutellum (hind angles).

Scutellum subtriangular, shorter than width at the base (15:26). Lateral borders convex; tip angularly rounded; disc transversely raised at the base, and with a low median carina behind basal elevation.

Hemelytra reach to $\frac{1}{2}$ of tergum VII; corium reaches a little over the middle of scutellum; its exterior border is carinate, convex.

Abdomen ovate, longer than maximal width across segment IV (75:63). Connexivum wide and flat. Connexiva II and III semifused, others clearly separated from each other. PE-angles II to VI barely protruding; PE-VII form an obtuse angle. Posterior border of tergum VII, and connexiva VII form together a barely sinuate line. Paratergites strong, conical, reach to $\frac{2}{3}$ of segment IX; the latter truncate posteriorly. Spiracles II to VIII lateral, and visible from above.

Legs: unarmed.

Colour: dark reddish-brown; connexivum, tibiae, and tarsi, yellow brown.

Total length, 5.84 mm; width of pronotum, 1.88 mm; width of abdomen, 2.52 mm.

Holotype: ♀, Malaysia, Malay Peninsula, Gap (Fraser's Hill) — A. M. Lea & wife coll.; deposited in the South Australian Museum, Adelaide.

Carventus malayensis n. sp. is related to *C. gestroi* Bergroth, 1892, from Burma, but differs from it by: larger size; antero-lateral angles of the pronotum rounded anteriorly and laterally, not obliquely truncate, and by different proportions of antennal segments.

2. *Carventus ovatus* n. sp.

Fig. 24

Male. Ovate, regularly tapering from the middle of abdomen forward, and less so backward; more or less covered with a greyish incrustation, with exception of antennae, legs, and membrane.

Head almost as long as width through the eyes (19:20), shorter than width across postocular tubercles (19:21.5). Anterior process stout, with parallel sides, notched anteriorly, reaching to the middle

of antennal segment I. Antenniferous tubercles moderately large, dentiform, acute, their exterior borders parallel, reaching to $\frac{1}{5}$ of antennal segment I. Eyes large, semiglobose, protruding. Post-ocular tubercles small, dentiform, produced beyond the outer border of the eyes. Vertex with "V"-form rows of fine granules, and laterad of them, with two (1 + 1) ovate, and finely granulate elevations. Antennae long, and slender, twice as long as the head (40:19). First segment robust, clavate; 2nd much thinner, tapering toward the base; 3rd subcylindrical, slightly dilated apically; 4th elongately fusiform. Proportions, I to IV, are: 12:7:12.5:8.5. Rostrum short, reaching to the base of rostral groove.

Pronotum much shorter than width across humeri (25:40); divided into two lobes by a thin, transverse sulcus. Fore lobe is distinctly narrower than the hind lobe (30:40). Collar clearly separated from the disc. Behind it is placed a short, subtriangular, almost an extended "V"-shaped, carina. Antero-lateral angles produced into lobes, rounded anteriorly and laterally, reaching forward as far as the collar. They are separated from the latter by deep incisures. Lateral border is doubly sinuate, and with a small tooth between sinuses. Lateral borders of the hind lobe convex, and slightly sinuate at the postero-lateral angles. Fore disc with two (1 + 1) oblique, granulate ridges at the bases of antero-lateral angles, and with two (1 + 1) callosities mesad of the latter. In the middle of the sulcus dividing both lobes is placed a small tubercle. Hind lobe finely granulate; a fine sulcus runs along the hind border of pronotum. The latter is straight in the middle, and angularly produced backward laterad of scutellum.

Scutellum short, wide, and semicircular, half as long as its width at the base (11:22.5). Disc is slightly raised, and granulate.

Hemelytra reach over fore border of tergum VII. Corium short, reaching $\frac{3}{5}$ of the length of scutellum; its exterior border is carinate. Membrane large, transparent.

Abdomen ovate, slightly longer than maximal width across segment IV (58:54). Connexivum wide, and slightly reflexed. Connexiva II and III semifused together; others clearly separated from each other. PE-angles of connexiva II to VI progressively protruding, rounded; PE-VIII angularly produced backward, but not reaching the tips of paratergites. Paratergites subcylindrical, reaching to $\frac{2}{3}$ of cordate, declivous hypopygium. Spiracles II sublateral, and not visible from above; III to VIII lateral, and visible.

Legs unarmed.

Colour: head, pronotum, scutellum, femora, claws, and antennal segments I, II, and IV, are dark brown; abdomen light brown; the base

of ant. segment I; the whole III, tip of IV, and tibiae are ochraceous, partly infusate.

Total length, 4.56 mm; width of pronotum, 1.6 mm; width of abdomen, 2.16 mm.

Holotype: ♂, Fiji Islands, Viti Levu—A. M. Lea coll.; deposited in the South Australian Museum, Adelaide.

Paratypes: 2 ♂, and 1 nymph, collected with the holotype; in the same collection, and collection of the author.

Carventus ovalus n. sp. is related to *C. malayensis* n. sp., but is smaller; anterior process of the head shorter, reaching only to the middle of antennal segment I; scutellum is semicircular, not subtriangular; PE-angles of connexiva more protruding.

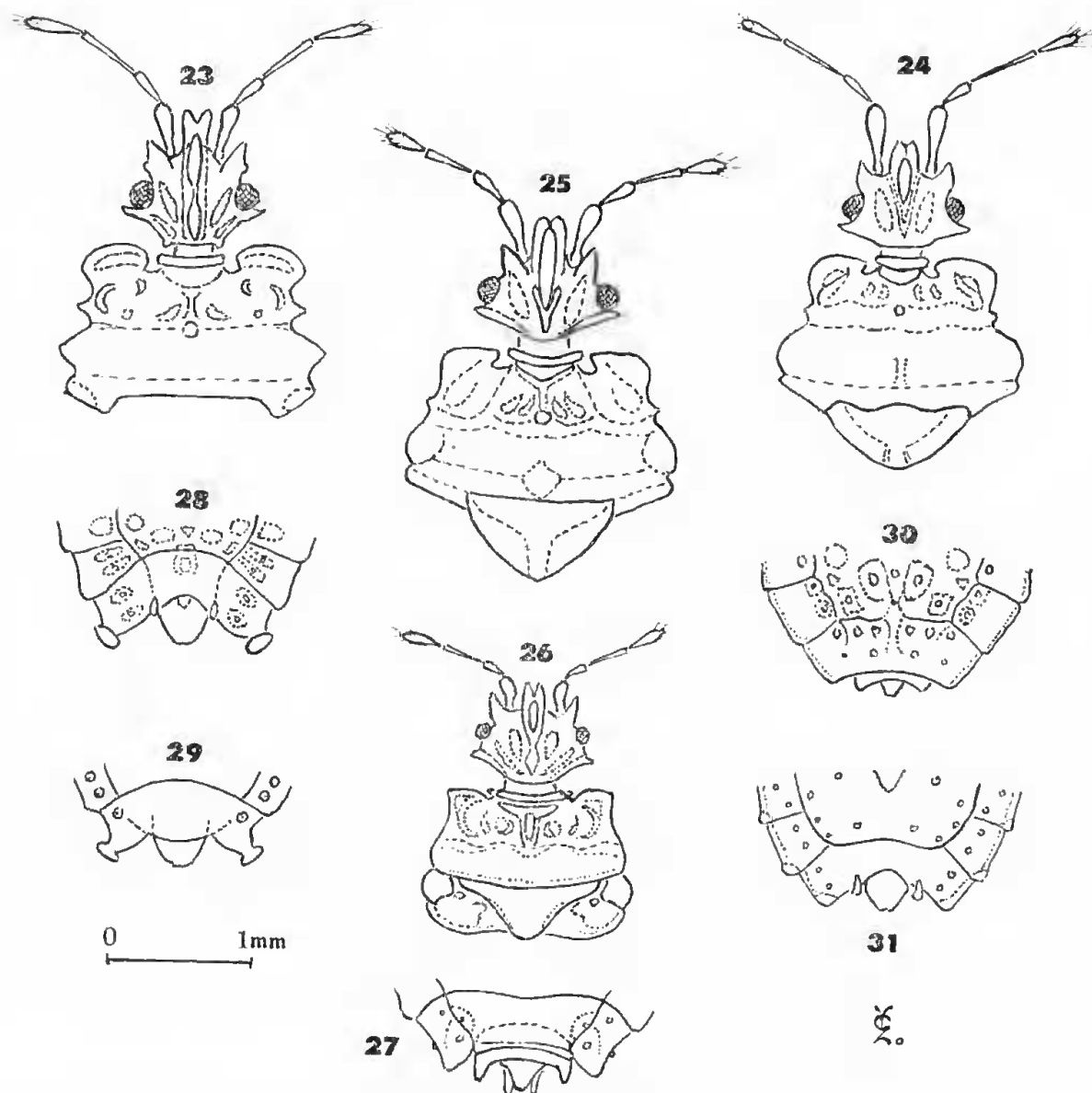
3. *Carventus robustus* n. sp.

Fig. 25

Male. Elongate ovate, rather robust; covered with brown incrustation, and accumulated dirt.

Head shorter than width through the eyes (♂—20:23, ♀—21:25). Anterior process robust, slightly constricted in the middle, and a little incised in front, reaches to $\frac{2}{3}$ of antennal segment I. Antenniferous tubercles dentiform, acute, divaricating, reach to $\frac{1}{2}$ of antennal segment I. Eyes large, semiglobose, protruding. Post-ocular tubercles small, dentiform, slightly produced beyond the outer border of the eyes. Vertex with a high median ridge, and with two (1 + 1) thin, lower carinae along the latter. Laterad of them are placed two (1 + 1) ovate, raised callosities. Antennae one and a half times as long as the head (30.5:20). Segment I robust, clavate; II and III tapering toward the base; IV fusiform. Proportions, I to IV, are: ♂—10:5:8:7.5, ♀—11:6:9:7. Rostrum short, reaching to the hind border of a wide, and deep, rostral groove, which is closed posteriorly.

Pronotum shorter than maximal width across humeri (♂—27:46, ♀—28:50). Fore lobe narrower than hind lobe (♂—37:46, ♀—38:50). Collar high, clearly separated from the disc. Just behind the collar is placed a narrow, transverse, granulate ridge; behind the ridge, on the median line runs a short and narrow sulcus, terminating with a high tubercle, placed on the interlobal depression. Laterad of the median sulcus are placed two (1 + 1) callosities, each of them bearing an oblique, granulate ridge. Antero-lateral angles form two (1 + 1) expanded lobes, truncate anteriorly, and rounded antero-laterally. Just behind these lobes are placed two (1 + 1) high, oblique ridges, divergent backward. Interlobal depression deep, and rather wide. Lateral borders doubly sinuate, with a large tooth between the sinuses.



Carventus malayensis n. sp., ♀, Fig. 23—head and pronotum.

Carventus ovatus n. sp., ♂, Fig. 24—head, pronotum and scutellum.

Carventus robustus n. sp., ♂, Fig. 25—head, pronotum and scutellum.

Carventus brachypterus n. sp., ♀, Fig. 26—head, pronotum, scutellum and hemelytra (pads); Fig. 27—tip of abdomen, dorsal aspect.

Acaraptera dimorpha n. sp., ♂, Fig. 28—tip of abdomen, dorsal aspect, Fig. 29—ventral aspect; ♀, Fig. 30—tip of abdomen, dorsal aspect.

Acaraptera (Lissaptera) denticeps n. sp., ♂, Fig. 31—tip of abdomen, dorsal aspect.

Hind lobe higher than fore lobe, granulate; a thin, transverse sulcus runs along hind border. Hind border straight in the middle, protruding backward laterad of scutellum.

Scutellum semicircular, half as long as its basal width (♂—13:25, ♀—15:28). Disc slightly raised, scabrous; median carina distinct on the hind half of the disc.

Hemelytra reach to the middle of tergum VII (δ), or to $\frac{1}{2}$ of tergum VII (φ). Corium rugose, reaches to $\frac{2}{3}$ of scutellum; its exterior border carinate, reflexed.

Abdomen slightly longer than its maximal width across segment IV (δ —58.55, φ —69.68). Connexivum wide; segments II and III semifused together; others clearly separated from each other. PE-angles II to VI progressively protruding, rounded; PE-VII produced backward as subangular, apically rounded, and reflexed lobes, which do not reach the tips of paratergites. Paratergites (δ) conical, reaching to the middle of a subcordate, declivous hypopygium; the latter with a median ridge tapering backward. In the female, paratergites short, conical, rounded apically, reaching slightly over the middle of segment IX; the latter is short, and rounded apically. Spiracles II to VIII lateral, and visible from above.

Legs unarmed.

Colour: dark reddish brown; tibiae slightly lighter; tarsi yellow-brown.

Total length: δ —4.64, φ —5.44 mm; width of pronotum: δ —1.82, φ —2.00 mm; width of abdomen: δ —2.20, φ —2.72 mm.

Holotype: δ , Fiji Islands, Tavanui—A. M. Lea coll.; deposited in the South Australian Museum, Adelaide.

Allotype: φ , collected with the holotype; in the same Museum.

Paratypes: 2 δ , 3 φ , and 1 nymph, collected with the holo, and allotype; 5 δ & 1 φ , Fiji, Viti Levu—A. M. Lea coll.; deposited in the same Museum and collection of the author.

Carventus robustus n. sp. is not closely related to any of Oriental species of *Carventus*, may be the nearest is *C. biroi* Kormilev, 1954, but it may be separated from the latter by: different shape of pronotum; all ridges and depressions of the latter are more pronounced; PE-angles of connexiva more protruding. The whole aspect of *C. robustus* n. sp. is that of sturdiness.

4. *Carventus minutus* Kormilev

Carventus minutus Kormilev, 1955, Rev. Eucat. Ent. Par., 2: 486.

Described from Deslaes Islands, it is now recorded from Papua.

1 δ , N.E. Papua, Mt. Lamington, 1,300-1,500ft.—C. T. McNamara coll.

5. *Carventus australis* Kormilev

Carventus australis Kormilev, 1958, Jour. N.Y. Ent. Soc.: 66: 87.

3 δ & 2 φ , Australia, Queensland, Mt. Tambourine—A. M. Lea coll.; 3 δ , Australia, N. Queensland, Cairns—A. M. Lea coll.; 1 φ , Australia, N. Queensland, Cairns; 1 specimen without tip of abdomen, Australia, N.S.W., Dorrigo.

6. *Carventus kirkaldyi* China

Carventus kirkaldyi China, 1930, Insects of Samoa, Part II, Hemiptera, fasc. 3: 109; Brit. Mus., London.

Described from Samoa, now is recorded from Fiji.

6 ♂, 4 ♀ & 4 nymphs, Fiji Islands, Viti Levu—A. M. Lea coll.

7. *Carventus brachypterus* n. sp.

Fig. 26-27

Female. Elongate ovate, brachypterous; the whole dorsal surface roughly granulate; incrustation almost absent.

Head slightly shorter than width through the eyes (18:19). Anterior process deeply cleft, genae being much longer than clypeus; reaches to the tip of antennal segment I. Antenniferous tubercles dentiform, acute, slightly divaricating; reaching to the middle of antennal segment I. Eyes small, semiglobose, protruding. Postocular tubercles blunt, separated from vertex by a fine sulcus; reaching to the outer border of the eyes. Vertex with a triple row of fine granules. Antennae short and slender, one and a half times as long as the head (26:18). Proportions of antennal segments, I to IV, are: 7:4:7.5:7.5.

Pronotum trapezoidal, half as long as its maximal width (17:34). Collar clearly separated from the disc. Antero-lateral angles lobulate, though the lobes are greatly reduced compared to macropterous species of the genus *Carventus* Stål; incisure between collar and antero-lateral angles also reduced, shallow. Lateral borders slightly sinuate before the middle, slightly convex after the middle. Hind border slightly convex. The whole pronotum, particularly the hind lobe, is reduced compared with fully winged *Carventus*: antero-lateral angles form subangular lobes, rounded at the tip, produced as far as fore border of the collar. Hind lobe is shorter, and only slightly wider than the fore lobe.

Scutellum subtriangular, short, and wide at the base (10:25). Lateral borders slightly sinuate, and subcarinate; disc convex, roughly granulate.

Metanotum consists of two (1 + 1) plates which are deeply depressed anteriorly, and bear an "S"-shaped transverse carina on each plate; their limits with scutellum and tergum I are formed by narrow, and moderately deep sulci.

Hemelytra reduced to small pads, without division into corium, clavus, and membrane. The latter is completely absent. Pads are convex exteriorly, and slightly excavate posteriorly; reaching to the middle of scutellum.

Abdomen longer than its maximal width across segment IV (60:49). Lateral borders regularly convex. Connexivum reflexed; PE-angles barely protruding; PE-VII subangularly rounded, and slightly produced backward. Connexiva I and II semifused, others separated. Terga I and II fused together, separated from the pronotum, and central dorsal plate, by fine sulci. Central dorsal plate consists of terga III to VI flat, slightly raised only along the median line. The first tergal gland opening is large, the 2nd reduced, the 3rd obsolete. Terga I and II roughly granulate. Tergum VII raised backward; along its hind border runs a double, fine sulcus. Tergum VIII very short and wide. Paratergites rather large, dentiform; segment IX with parallel sides, tricuspidate apically. Spiracles II to V ventral, and not visible from above; VI sublateral, slightly visible; VII lateral, and visible; VIII dorso-lateral.

Legs unarmed.

Colour: testaceous, partly darker; connexiva bicolorous; their outer borders dark brown anteriorly, and yellow posteriorly.

Total length, 4.28 mm; width of pronotum, 1.36 mm; width of abdomen, 1.96 mm.

Holotype: ♀, Tasmania, Manawah—A. M. Lea coll.; deposited in the South Australian Museum, Adelaide.

Usinger and Matsuda mentioned the existence of brachyptery in *Carventus* (1959: 120), but to date no brachypterous species has been described (to my knowledge). It is rather difficult to locate *Carventus brachypterous* n. sp. taxonomically because its pronotum is modified by brachypterism, but the head is typically that of a *Carventus*; connexiva I and II semifused as in the macropterous species; antennae and legs are also as in macropterous species.

Gen. *Acaraptera* Usinger & Matsuda, 1959

This curious, apterous genus was recorded from Samoa, Fiji, New Zealand, and adjacent islands. Now we have three more species from Lord Howe Island, a small island in the Southern Pacific between New Zealand and Australia. Usinger and Matsuda split this genus into three subgenera: *Acaraptera sensu strictu*, *Nesiaptera*, and *Lissaptera*. One of the new species belongs clearly to *Lissaptera*, but the other two, though with some difficulty, I have placed into *Acaraptera sensu stricto*.

One of the new species, belonging to *Acaraptera* s. str., shows a curious sexual dimorphism; the males have on the ventro-lateral side of connexivum VII two (1 + 1) large, obovate tubercles placed on a protuberance; these tubercles are absent in the females. Moreover in the males, sterna II and III are fused in the middle, but they are

separated in the females. Another new species, belonging to *Acaraptera* s. str., is represented only by the females, so it could not be proved if it also has this dimorphism. In *Acaraptera myersi* Usinger & Matsuda, 1959, the males do not have pedunculate, obovate tubercles, as in the abovementioned species, but on corresponding places may be seen ovate callosities.

The second new species differs from other *Acaraptera* species by a highly elevated median portion of the body, forming a stout ridge running from the pronotum to tergum VII, similar to some species of the genus *Biroana* Kormilev, 1957, but the pattern of small ridges on the pro, meso, and metanotum is more similar to that of *Acaraptera*, than of *Biroana*; also the body is not pilose, but only scabrous because of numerous small ridges, and fine punctures, so that I have decided to put it also in *Acaraptera*.

1. *Acaraptera dimorpha* n. sp.

Fig. 28-30

Male. Elongate ovate, rather flat; covered with greyish incrustation; apterous.

Head transverse, much shorter than width through the eyes (δ —15.5:21.5, φ —16:22). Anterior process short, anteriorly cleft, genae being longer than clypeus; reaching to $\frac{1}{3}$ of antennal segment I. Antenniferous tubercles strong, acute, flat, and divergent; reaching to $\frac{1}{4}$ of antennal segment I. Eyes small, protruding. Postocular portions of the head produced into blunt teeth, reaching to the outer borders of eyes. Hind border slightly convex in a wide arc. Vertex with "V"-shaped carina, and laterad of it with two (1 + 1) ovate callosities. Antennae twice as long as the head (δ —31.5:45.5, φ —29.5:46). Proportions, I to IV, are: δ —10:6:7.5:8, φ —10:6:6.5:7.5. Rostrum short, reaching to hind border of a shallow rostral groove.

Pronotum distinctly separated from mesonotum, much shorter than the maximal width across humeri (δ —9:30, φ —10:32). Collar indistinctly separated from the disc, and in the middle produced backward as a median carina. Antero-lateral angles slightly expanded, and depressed, subangularly rounded; at their base run arcuate carinae (1 + 1) starting from the collar, and reaching to the hind border of the disc laterally. Disc itself is irregularly rugose. Median carina finely sulcate on median line.

Mesonotum wider than pronotum (δ —34:30, φ —40:32); its lateral borders carinate, and divergent backward; median carina widening backward, and fused with a median elevation of metanotum, and tergum I. The latter is finely, longitudinally sulcate. Hind

borders finely carinate. Disc with six ($3 + 3$) semifused, depressed, irregular carinae, and deep depressions between the middle and outer carinae.

Metanotum forms two ($1 + 1$) large irregularly rounded plates separated by a median elevation. From the middle of the round plates run backward two ($1 + 1$) longitudinal carinae, produced posteriorly across terga I and II, and reaching central dorsal plate, dividing terga I and II into a median and two lateral portions.

Abdomen longer than maximal width across segment V (δ), or IV (φ) (δ —50:43, φ —55:50). Tergum I separated from metanotum by a fine carina in the middle, and by fine sulci laterally. Tergum II separated from tergum I, and central dorsal plate by fine sulci. Central dorsal plate consists of terga III to VI, it is raised on the median line, and sloping laterally. It is provided with the usual pattern of callosities, surrounded by flat carinae. In the male, PE-angles of connexiva III to VI are slightly and progressively produced, and rounded; in the female, not produced. In the male, PE-VII is angularly rounded, and reflexed; on its ventro-lateral side are placed two ($1 + 1$) protuberances, terminating in obovate, shiny tubercles. In the female, lateral borders of abdomen evenly arcuate, without any protuberances. Paratergites, in both sexes, small, and blunt, directed obliquely upward in the male. Hypopygium elongate ovate, caudal in position, produced as far as obovate tubercles. Segment IX in the female small, rounded posteriorly, produced slightly beyond paratergites. Spiracles II and III are lateral and visible from above; IV to VII ventro-lateral; VIII terminal.

Meso, and metasternum, are fused in both sexes; sterna II and III fused only in the male, free in the female. Sterna IV to VII separated from each other.

Legs unarmed. Trochanters free; femora slightly inflated; claws with small arolia.

Colour: yellow brown; lateral borders of pro, meso, and metanotum, median elevation on terga I and II, flat carinae on central dorsal plate, PE-angles of connexiva III to VII, and tarsi, yellow. In the female, body dark brown to reddish brown, with even, yellow lateral borders from pronotum to tergum VII.

Total length: δ —3.6 mm, φ —3.82 mm; width of pronotum: δ —1.2 mm, φ —1.28 mm; width of abdomen: δ —1.72 mm, φ —2.00 mm.

Holotype: δ , Lord Howe Island (Southern Pacific)—A. M. Lea coll.; deposited in the South Australian Museum, Adelaide.

Allotype: φ , collected with the holotype; in the same collection.

Paratype: 1 ♂, collected with the holo, and allotype; in the collection of the author.

Acaraptera dimorpha n. sp. may be separated from *A. myersi* Usinger & Matsuda, 1959, from New Zealand, by its much larger size, by a different pattern of carinae, and depressions, on pro, meso, and metanotum, and abdomen; males also have pedunculate processes on PE-VII, which are absent in *A. myersi*, and replaced there by ovate, shiny tubercles.

2. *Acaraptera minuta* n. sp.

Female. Ovate, scabrous; raised on median line from pronotum to tergum VII. Head finely granulate; body very finely punctured, covered with thin incrustation.

Head shorter than width through the eyes (10:14.5). Anterior process stout, short, and subtruncate anteriorly, clypens being very slightly longer than genae, reaching to $\frac{2}{3}$ of antennal segment I. Antenniferous tubercles very short, robust, reaching very slightly over the base of antennal segment I. Eyes very small, semiglobose, protruding; their facets are convex. Postocular tubercles small, blunt, almost reaching to the outer border of eyes. Vertex with a "V"-shaped carina. Antennae almost twice as long as the head (18.5:10). Antennal segment I robust, fusiform; II ovate; III and IV semifused together (fused in nymphal stage), III tapering toward the base, and petiolate, IV robust, pyriform. Proportions, I to IV, are: 9:2.5:3:4. Rostrum short, but robust, reaches to the base of the head.

Pronotum one third as long as its maximal width (7:22). Collar ill defined; anterior border truncate; antero-lateral angles rounded; lateral borders convex. Disc with a "T"-form median ridge, which is sulcate on median line; along lateral borders run two (1 + 1) robust ridges. A few raised, shiny callosities laterad of median ridge. Pronotum is fused with mesonotum in the middle, separated laterally by deep furrows, or depressions.

Mesonotum and metanotum are fused in the middle into a thin, high ridge; separated laterally by deep sulci. Median ridge sulcate on median line. Posteriorly it is connected with diverging ridges of tergum I. Mesonotum with ill defined carinae along lateral borders, and with four (2 + 2) raised, curved callosities on each side of median ridge, separated from the latter by deep depressions. Metanotum has six (3 + 3) similar callosities on the disc laterally, and even deeper depressions along the median ridge.

Abdomen shorter than width across segment IV (27:32). Tergum I is completely fused with metanotum, but separated from tergum II by a transverse depression. Tergum II is split into two (1 + 1)

ridges in the middle, and deeply depressed laterally. Central dorsal plate consists of terga III to VI; it is highly raised in the middle, forming a stout median ridge, abruptly sloping laterally. Laterad of median ridge are placed fine carinae, and depressions; each segment bears six ($3 + 3$) round, callous spots. Tergum VII has a thinner median ridge tapering, and sloping, backward. Connexivum wide, with a sublateral, longitudinal carina, sloping medially, and bearing on inner side round, callous spots. PE-angles not protruding; PE-VII rounded. Spiracles II, III, and VII lateral, and visible from above; IV to VI sublateral, but still visible; VIII terminal. Paratergites small, blunt, reaching to the middle of segment IX which is short, rounded posteriorly.

Legs robust, and unarmed.

Colour evenly testaceous; PE-III to PE-VI, and tarsi, are yellow.

Total length, 2.12 mm; width of pronotum, 0.88 mm; width of abdomen, 1.28 mm.

Holotype: ♀, Lord Howe Island (Southern Pacific)—A. M. Lea coll.; deposited in the South Australian Museum, Adelaide.

Paratypes: 3 ♀, collected with the holotype; in the same collection, and collection of the author.

3. *Acaraptera* (*Lissaptera*) *denticeps* n. sp.

Fig. 31

Male. Ovate, flat; head, antennae, and legs partially, finely granulate; rest of the body very finely punctured.

Head shorter than width through the eyes (17:22.5). Anterior process strong, forked in front, genae being much longer than clypeus and divergent; they reach to $\frac{2}{3}$ of antennal segment I. Antenniferous tubercles strong, acute, slightly divaricating. Eyes small, protruding, with convex facets. Postocular portion of the head produced into flat, acute angles, produced as far as outer border of the eyes. Vertex with two contiguous carinae, and laterad of them with two ($1 + 1$) ovate callosities. Antennae short, only one and a half times as long as the head (26:17); proportions, I to IV, are: 9:4:6:7. Rostrum reaches to the base of a shallow rostral groove.

Pronotum four times as wide as long in the middle (8:33). Antero-lateral angles slightly expanded, and rounded, forming small, rounded lobes. Collar poorly separated from the disc. Along anterior, lateral, and posterior borders run thin carinae, slightly blurred at humeri. Disc uneven, finely punctured; with a low, ill defined, median carina, and with ten ($5 + 5$) small callous spots laterad of it.

Mesonotum and metanotum completely fused together, and with terga I and II, in one large plate, half as long as wide (23:42). Meso and metanotum are separated only laterally by fine sulci, evanescent before the middle of the disc. Disc is slightly longitudinally raised on the median line on meso, and metanotum, slightly depressed on tergum II; disc is provided with a few small, irregularly shaped, symmetric, callous spots. Lateral borders of meso, metanotum are slightly swollen, and fused with connexivum II.

Abdomen (inclusive of terga I and II) as long as wide across segment IV (45:45), flat, slightly raised on median line, sloping laterally. Central dorsal plate subrectangular, with rounded postero-lateral angles. Disc finely punctured, and provided with 20 ($10 + 10$) small, round, callous spots, distributed into six ($3 + 3$) rows. Connexivum wide, slightly raised laterally; all segments clearly separated from each other. PE-angles II to VI slightly protruding, and rounded; PE-VII angularly rounded, and produced backward. Paratergites small, clavate. Hypopygium conical, slightly produced beyond PE-VII. Spiracles lateral and visible from above on II, III, VI, VII, and VIII; sublateral and not visible on IV and V.

Legs unarmed.

Colour: ferrugineous to chestnut-brown; PE-angles of connexiva II to VI, and tarsi yellow.

Total length, 3.64 mm; width of pronotum, 1.32 mm; width of abdomen, 1.80 mm.

Holotype: ♂, Lord Howe Island (Southern Pacific)—A. M. Lea coll.; deposited in the South Australian Museum, Adelaide.

Acaraptera (Lissaptera) denticeps n. sp. may be separated at once from *A. (L.) completa* Usinger & Matsuda, 1959, by the developed postocular tubercles, which are almost absent in the latter.

REFERENCES

- Usinger, R. L. and Matsuda, R., 1959: Classification of the Aradidae (Hemiptera-Heteroptera); London, British Museum, VII—416 pp., 101 figs.

RESUMEN

El autor ha estudiado un importante lote de los Arádidos (Hemíptera) de las colecciones del Museo de Australia del Sur en Adelaide. Debido a la cantidad grande de las especies estudiadas, en este trabajo eran tratadas solamente las subfamilias Isodermiinae, Prasymptestinae, Acadiinae, Calisinae, Aneurinae y Carventinae, dejando a la subfamilia Mezirinae para el trabajo próximo. En este parte están descritas 14 especies nuevas para la ciencia, procedentes de Australia, Nueva Guinea, Fiji, algunas islas pequeñas del Pacífico Meridional y Malasia.